

INSTRUCTION MANUAL
FOR
MORROW
CONVERTER
MODELS

5 BR 1
5 BR-2 5 BRF -2 5 BRLN -2

**MORROW RADIO MFG. CO.
SALEM OREGON**

GENERAL: 5BR - 6 or 12 volt.

The MORROW converter is a superhetrodyne tuner for use with an auto radio for the reception of; 10-15-20-40-75-80 meter stations.

The slide rule edge illuminated dial is controlled by a 12-1 tuning ratio knob. The dial is calibrated to better than 1%, and all band edges start and stop at the same dial settings. The knob on the left of the converter controls the band switch and on-off switch. The small knob in the lower center, controls the antenna trimmer and should be adjusted for maximum noise when off station.

A three gang tuning condenser tunes the RF amplifier, mixer and oscillator, as in the better communication receivers. High stability ceramic trimmers are used throughout the mixer and oscillator. Each oscillator range is stabilized by negative temperature compensating condensers to insure freedom from drift. The LC ratios were chosen to give the highly desirable bandsread ranges. All oscillator adjustments are set when the alignment is made and no external control of the oscillator is needed or desirable. Tuning the RF amplifier and the mixer greatly improves the image rejection ratio and improves the weak signal response.

An IF amplifier is included in the converter to make possible the resetting of the auto radio to match the converter output frequency of 1525 KC. A very effective trap has been included in the converter to stop broadcast breakthru. It will be only rarely, trouble from this point will be found, and in these cases a slight shift of converter IF will eliminate the undesirable station.

To operate the converter, after it is once installed, the band switch should be turned to the band desired and allowed to warm up for a short time. The auto radio should be tuned to 1525 KC and adjusted to maximum noise level. This tunes the auto radio to the converter output frequency and this tuning, in turn, controls the dial calibration. In other words, if the auto radio dial is off 20 KC, the converter dial will read off 20 KC. As the converter is calibrated to within a few thousand cycles, the auto radio should be set as accurately as possible.

Tune the converter off the station and adjust the antenna trimmer to maximum noise level. If ignition interference is strong, turn the limiter on. Switch on the back panel. The converter is now ready to use.

More detailed information will be found in the later pages of this booklet, and the following suggestions offered, are strongly recommended. Be sure to install the RF gain control as described under the same heading on the following page.

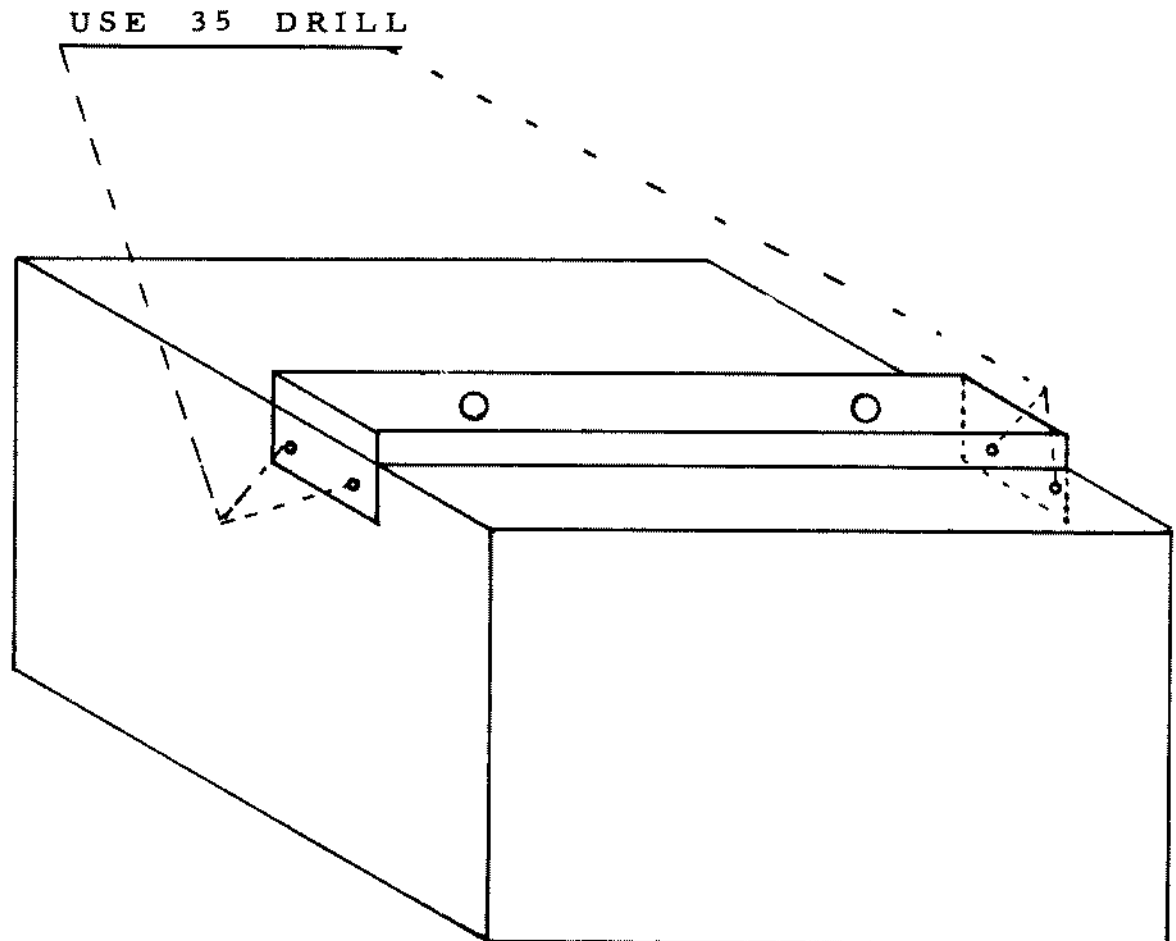
The converter has been carefully designed to give exceptional performance and many hours of enjoyment are to be had by careful installation.

CHOOSING CONVERTER LOCATION:

The converter should be solidly mounted beneath the dash, in glove compartment or other suitable location. It is not generally recommended that the steering post be used as a mounting location, due to excessive road shock.

Consideration should be given to length of antenna and power lead when choosing a location for the converter, although they may be extended to suit special situations.

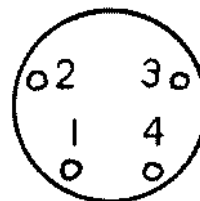
The mounting strap supplied with the converter is drilled, however, the case is not. The reason for this is the many possible positions. When drilling the case, it is not necessary to remove the chassis if reasonable care is used. Do not penetrate the case with the drill more than one-half inch. Use a number 35 drill when drilling to #6 sheet metal screw or 6-32 machine screw. Use four (4) screws. Do not drill any holes within an inch and a quarter of the front edge.



POWER TO THE CONVERTER:

The shielded cable with a 4 prong plug attached carries the A and B supply together with the noise limiter leads from the receiver to the converter. The number 3 wire is shielded from the other wires in the cable. The cable connections are as follows, looking at the **BOTTOM OF THE SOCKET**.

- Pin #1--B plus 200 to 250 volts.
- Pin #2--Noise limiter input.
- Pin #3--Noise limiter output.
- Pin #4--Filament. 6 volts 1.2 amp.
or 12 volts .6 amp.



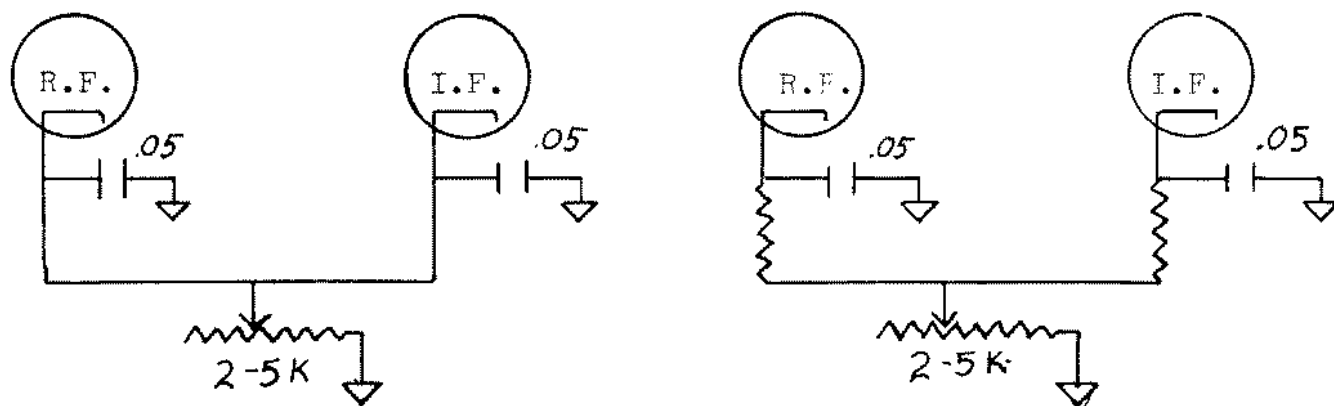
The converter draws 20-25 mills at 250 volts and 1.2 amps at 6 volts. The filament voltage should be taken from one of the RF or IF tube sockets, not from the power switch or near the vibrator. The B plus should be taken from a well regulated point. In some cases it may be desirable to install a separate filter network from the cathode of the auto radio rectifier (6X5, etc.) to the converter power socket on pin number 2. This should consist of a 500 or 1000 ohm resistor from 6X5 cathode to number 2 pin, and the number 2 pin bypassed to chassis with a 8 to 10 mfd electrolytic condenser. If this filter is installed there will be no chance of upsetting the voltage distribution within the auto receiver. (See fig. 1). This voltage will not need to be regulated as a Clapp oscillator is used in the converter and its frequency and voltage curve is, for all intents and purposes, flat from 100 to 400 volts. Be sure to use shielded wire from the #2 and #3 pins on the power socket. See automatic noise limiter sheet for more details.

When changing from 6 to 12 volts, the 6AL5 tube must be changed to a 12AL5 and a 12 volt pilot lamp should be substituted for the 6 volt now installed. Two jumper wires must be reconnected as per sketch in the back of this booklet.

RF and IF AUTO RADIO GAIN CONTROL:

The IF and RF gain control in the auto radio is very important and should not be overlooked. The reason for the gain control is as follows: The input sensitivity on the average auto radio is in the range of 5 to 50 micro volts. The output of the converter is about 100 times this value. The difference will appear as noise, which will develop enough AVC voltage to cut the sensitivity of the RF tube in the converter down to the point where very weak signals will not be heard. The AVC however, is necessary in the converter, to stop blocking when close to other stations.

To install the gain control, it is necessary to lift the RF and IF tube cathodes from ground and run them through a 2000 to 5000 ohm control to ground. Bypass each cathode to ground with a .05 condenser. In some cases the cathodes will have resistors installed to ground and these should be left in the circuit with the lower ends going to the control. See diagram on next page.



ANTENNA CONSIDERATIONS:

A transmitting antenna should always be used for best performance when receiving any given band.

It is important to remember when receiving on a high frequency band and using a low frequency antenna, that the antenna loading coil should be shorted out otherwise it will act as a RF choke in the antenna lead and greatly cut down the received signals. The converter is designed for from 50 to 75 ohm antenna lead, as this in most cases, approximates the impedance of a resonant mobile antenna.

Three sockets will be found on the back of the converter. The short length of coax supplied with the converter should be inserted in the one marked "output" and the other end of this coax inserted in the broadcast receiver antenna socket. The socket marked "B C" is for the broadcast receiver antenna. The broadcast receiving antenna is automatically switched to the broadcast receiver when the converter is turned off. The antenna socket marked "S W" is for the termination of the transmitting antenna. In case a transmitter is installed in the car, the antenna lead would go to the antenna change over relay before entering the converter.

A tuned trap is installed in the converter from the RF tube plate to ground and this shunts all broadcast frequencies, ei., 1525 KC's to ground and no broadcast interference should be present. The adjustment of this trap is discussed in detail on the alignment page.

ALIGNMENT:

This converter has been carefully aligned before shipping from the factory and no adjustment should be necessary. The following information is for future use when the occasion may arise.

Before making any adjustments read the following carefully and proceed with caution.

The IF amplifier must be aligned out of the case. The equipment needed is a signal generator with output on 1525 KC and a vacuum tube voltmeter for reading AVC voltage.

IF AMPLIFIER:

Have converter connected to receiver and the receiver should be tuned carefully on 1525 KC. Allow 10-15 minutes for warm up. Connect the signal generator ground to converter chassis and the hot lead thru a .05 condenser to the rear tuning condenser lug. (Mixer grid). Use as low an output as possible and still get reliable AVC readings and adjust all IF transformers to 1525 KC.

Move hot lead to center lug of condenser, increase generator output for AVC reading and adjust BC trap for minimum reading. The above adjustments should all be done with converter on the 75 meter band position of wave band switch.

Remove trimmer access plate on top of cabinet. Always use lowest output from generator possible. Use VTVM to read AVC voltage.

on 15 and 10 meter bands rock dial when setting mixer trimmer to offset any pulling of oscillator.

75 METERS:

1. Converter in case. Check auto radio frequency 1525 KC.
2. Feed 4MC signal into antenna socket. Set dial 4MC.
3. Adjust 75 meter Osc. trimmer to frequency. Antenna trimmer and 75 meter mixer trimmer to maximum AVC.
4. Set generator to 3.5MC and dial to 3.5MC.
5. Adjust 75 meter Osc. coil slug to frequency. (Core thru coil)
6. Repeat until calibration correct.

40 METERS:

1. Converter in case. Check auto radio frequency, 1525 KC.
2. Feed 7.3MC signal into antenna socket and set dial to 7.3MC.
3. Adjust 40 meter Osc. trimmer to frequency, adjust antenna trimmers and 40 meter mixer trimmer to maximum AVC.
4. Set generator to 7MC and set dial to 7MC.
5. Adjust 40 meter Osc. coil slug to frequency. (Core thru coil).
6. Repeat until calibration correct.

20 METERS:

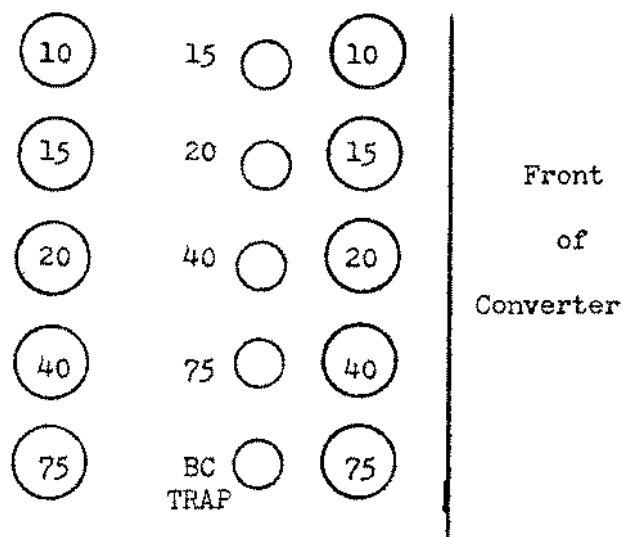
1. Converter in case. Check auto radio frequency, 1525 KC.
2. Feed 14.35 MC signal into antenna socket and set dial to 14.35 MC.
3. Adjust 20 meter osc. trimmer to frequency, adjust antenna trimmers and 20 meter mixer trimmer to maximum AVC.
4. Set generator to 14 MC and set dial to 14 MC.
5. Adjust 20 meter osc. coil slug to frequency (Core started in coil).
6. Repeat until calibration correct.

15 METERS:

1. Converter in case. Check auto radio frequency, 1525 KC.
2. Feed 21.45 MC signal in antenna socket. Set dial 21.45 MC.
3. Adjust 15 meter osc. trimmer to frequency. Adjust antenna trimmers and 15 meter mixer trimmer to maximum AVC.
4. Set generator to 21 MC and set dial to 21MC.
5. Adjust 15 meter osc. slug to frequency (Core started in coil).
6. Repeat until calibration correct.

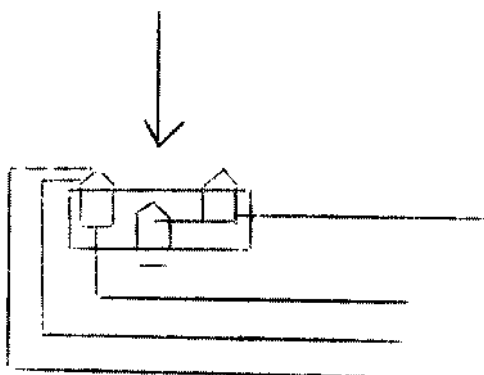
10 METERS:

1. Converter in case. Check auto radio frequency, 1525 KC.
2. Feed 29.7 MC signal into antenna socket and set dial to 29.7 MC.
3. Adjust 10 meter osc. trimmer to frequency. Adjust antenna trimmers and 10 meter mixer trimmer to maximum AVC.
4. Set generator to 28 MC and set dial to 28 MC.
5. Adjust loop on ten meter coil (converter must be removed from case. Coil setting on chassis in bottom of OSC compartment. Chassis must be in case for final check.)
6. Repeat until calibration correct.

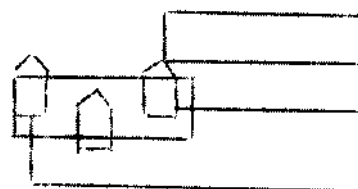


6 volt heater wiring

Grd Jumper



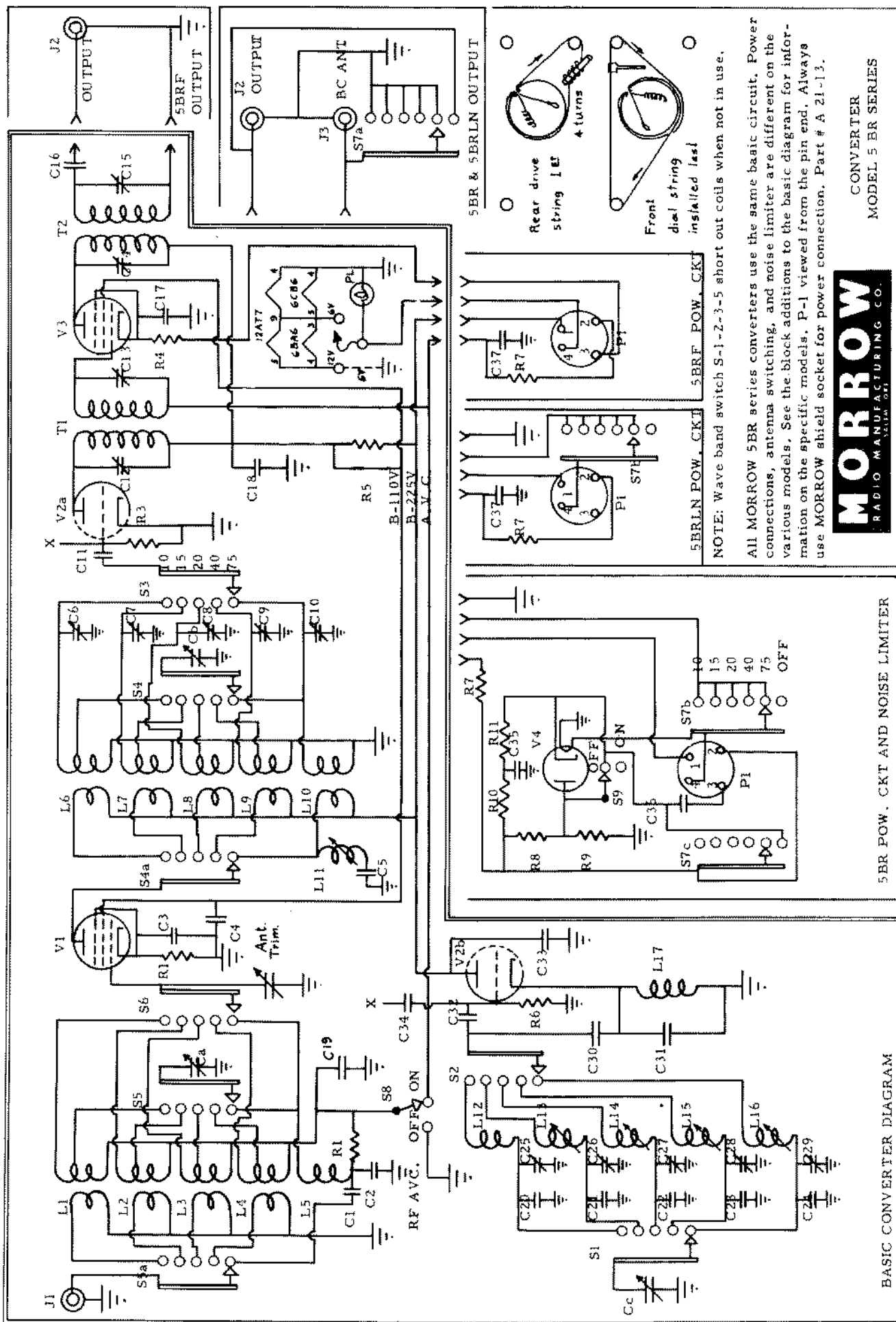
12 volt heater wiring



For 12 volt operation:

Remove the ground jumper. Move the Black and Purple wires as shown.

Replace the pilot lamp with a G. E. 1815 or equivalent. Replace the 6AL5 with a 12AL5.



RESISTORS

R1	100 K	R7	2.2 meg
R2	180	R8	100 K
R3	2.2 megohm	R9	100 K
R4	2200 5BR 5BRLN	R10	1 megohm
R4	1000 5BRF	R11	1 megohm
R5	27 K 1W		
R6	47 K		

All resistors 1/2 watt (unless otherwise specified),
Where K is resistance in thousands of ohms.

CAPICATORS

Ca	RF section, tuning cond.		
Cb	Mixer section, tuning cond.		
Cc	Oscillator section, tuning cond.		
C1	0.001 mfd 100 GP 500v		
C2	100 mmfd 1000 GP 500v		
C3	0.01 mfd disc 500v		
C4	0.01 mfd disc 500v		
C5	500 mmfd NPO trimmer		
C6	5-25 mmfd NPO trimmer		
C7	5-25 mmfd NPO trimmer		
C8	5-25 mmfd NPO trimmer		
C9	5-25 mmfd NPO trimmer		
C10	5-25 mmfd NPO trimmer		
C11	25 mmfd GP-25 500v		
C12	Mica compression trimmer in T1		
C13	Mica compression trimmer in T1		
C14	Mica compression trimmer in T2		
C15	Mica compression trimmer in T2		
C16	25 mmfd GP-25 500v		
C17	0.01 mfd disc 500v		
C18	0.01 mfd disc 500v		
C19	0.01 mfd disc 500v		
C20	N330 60T	50 ± 2.5 mmfd	A8-23
C21	N330 60S	120 ± 6 mmfd	A8-24
C22	N330 60	110 ± 5.5 mmfd	A8-25
C23	N220 30T	68 ± 3.4 mmfd	A8-26
C24	N1400 250T	14 ± 1.4 mmfd	A8-27
C25	5-25 mmfd NPO trimmer		
C26	5-25 mmfd NPO trimmer		
C27	5-25 mmfd NPO trimmer		
C28	5-25 mmfd NPO trimmer		
C29	5-25 mmfd NPO trimmer		
C30	250 mmfd silver mica 500v		
C31	250 mmfd silver mica 500v		
C32	100 mmfd silver mica 500v		
C33	0.01 mfd disc 500v		
C34	2.2 mmfd GP-2.2 500v		
C35	0.1 mfd 200v paper		
C36	0.01 mfd disc 500v		
C37	.05 200v paper		

CONVERTER

Factory Parts Number

L1	10 meter antenna coil	CF1003
L2	15 meter antenna coil	CF1006
L3	20 meter antenna coil	CF1009
L4	40 meter antenna coil	CF1013
L5	75 meter antenna coil	CF1023
L6	10 meter mixer coil	CF1003
L7	15 meter mixer coil	CF1006
L8	20 meter mixer coil	CF1010
L9	40 meter mixer coil	CF1014
L10	75 meter mixer coil	CF1017
L11	Broadcast trap coil	CF1022
L12	10 meter oscillator coil	CF1005
L13	15 meter oscillator coil	CF1007
L14	20 meter oscillator coil	CF1012
L15	40 meter oscillator coil	CF1016
L16	75 meter oscillator coil	CF1021
L17	RF choke coil	C1006

SWITCHES

S1, 2, 3, 4, 6	1 pole, 5 position shorting wafer with off position	A36-31
S4, 4A	2 pole, 5 position non-shorting wafer with off position	A36-30
S5, 5A	2 pole position non-shorting wafer with off position	A36-30
S7A, B, C	Special wafer. Antenna changeover, filament, noise limiter shorting.	A36-37

TUBES

V1	6CB6	
V2	12AT7	
V3	6BA 6	
V4	6AL5	6 volt models, 12AL5 12 volt models

AUTOMATIC NOISE LIMITER

The MORROW automatic noise limiter is a series gate limiter and will be found to be very effective on pulse type noise as produced by auto ignition systems. It is also effective to a remarkable degree on random noise as produced by power wires etc.

Despite the effectiveness of the limiter, the distortion to speech and music is low enough to make it useful when listening to the BC band. The limiter may be turned off however, when not needed, by the side switch on the back of the converter. There is no volume change when the limiter is turned on or off.

The limiter is installed between the diode detector and the first audio stage of the receiver. In most receivers the diode and the first audio tube are combined into one bulb. Fig. 1 is a typical diagram for the detector and audio as will be found in many receivers.

Fig. 1 has some items to note: 1: the cathode is grounded. 2: the grid bias comes from the 5 to 10 meg. grid resistor. 3: Diode D2 is a clamping diode to help keep the AVC line always negative. 4: The volume control R3 is also the diode load resistor. 5: Must use a high MU triode.

The actual noise limiter connection to figure 1 are shown in Fig. 2. Use shielded wire from pin #2 and #3 on the power socket to the detector stage. This circuit is to be recommended as it is simple and very effective.

ALL CONNECTIONS TO THE POWER SOCKET ARE AS VIEWED FROM THE BOTTOM OF THE POWER PLUG.

Fig. 3 shows a modified circuit of Fig. 2. The only difference is in the method used to get the receiver AVC operating voltage. D2 is used as AVC rectifier rather than as a clamping diode. The AVC for the converter is taken off the noise limiter in the converter and has no bearing on the receiver AVC system.

In some cases the diode load resistor R3 is not the volume control as shown in figures 1-2-3. In this case a separate resistor is used, and the audio is fed off the top of R3 over to the volume control R7 as shown in Fig. 4. In this case the coupling condenser C6 and resistor R3 should be removed from the circuit and the converter connections made as shown.

C1, C2, or R1, and or, a combination of them may not be in all receivers. They serve as an IF filter and keep the IF frequency out of the audio system. Sometimes C1, and C2, are made as part of the IF transformer trimmer condenser and they are installed in the transformer shield can along with the resistor R1.

Fig. 5 shows Fig. 1 with the noise limiter drawn in as the circuit actually is when the converter power plug is connected and in place.

In a good many receivers the diode cathode is not grounded as the Buick 980868, see Fig. 6. The cathode resistor R8 supplies bias to the triode amplifier and R9 supplies delay voltage to the AVC and audio system. For our purpose we want no delay voltage and the revised diagram Fig. 7 should be followed.

Connect the power socket as shown and remove wire from junction R1-R3 to R7. Remove R3. Disconnect wire #A from cathode and connect to ground. Install 1N34 as shown and remove wire to diode plate D1.

When any noise limiter is installed there is an insertion loss of about 50% of the audio voltage in the receiver. Most receivers have plenty of audio gain and the loss is of no consequence. However for those who wish, a 6C4 amplifier may be installed to bring the audio gain back up to normal. Fig. 8 shows a 6C4 amplifier added to an installation on a Buick 980782.

The only difference in the diagram between Fig. 7 and Fig. 8 other than the 6C4 stage is the way the audio is fed into the volume control thru C3. To install the limiter in this receiver, install the power socket as shown and cut wire from R1 to C3. Remove R3. Install 1N34 as shown and remove wire to the diode plate D1. Remove wire A from cathode and connect to ground.

By following the above examples the installation of the limiter on any receiver should be no problem. The idea to keep in mind when installing the limiter is to have the diode detector working always against ground and not have any extraneous DC voltages appearing in the noise limiter circuit.

BRLN SERIES CONVERTERS

The BRLN converters are identical to the BR series except the noise limiter is omitted, see diagrams on the last page of this booklet.

The installation of the BRLN is the same as the BR except no connection is to be made to pin #3 on the power socket and pin #2 goes to the receiver AVC line. See Fig. 1 thru 8 for AVC points.

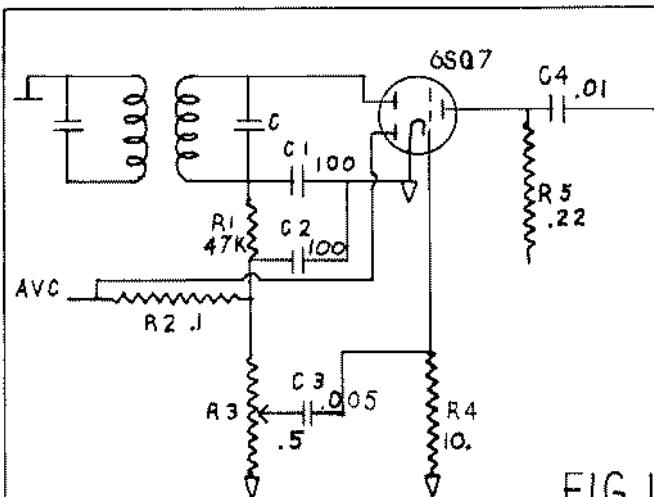


FIG 1

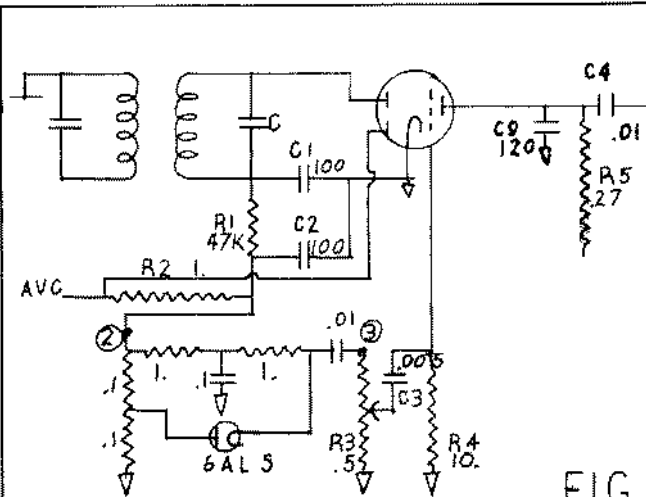


FIG 5

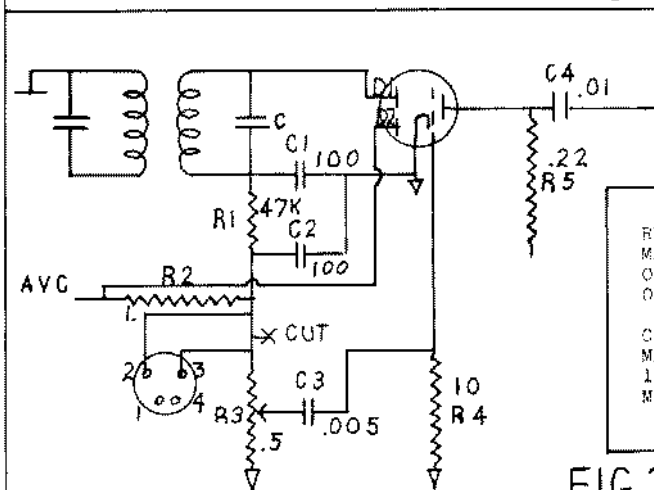


FIG 2

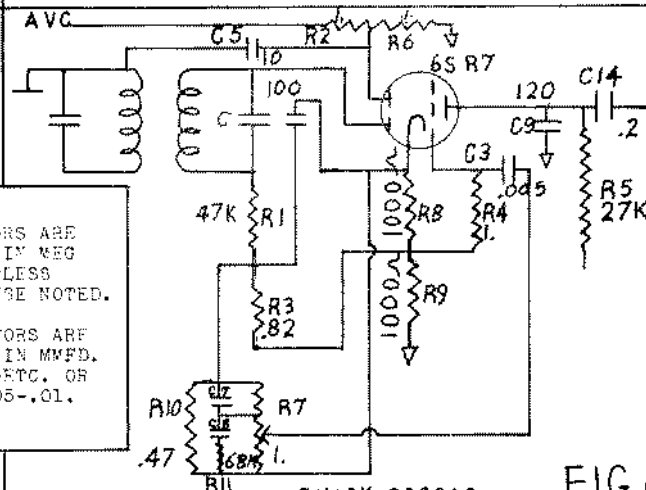


FIG 6

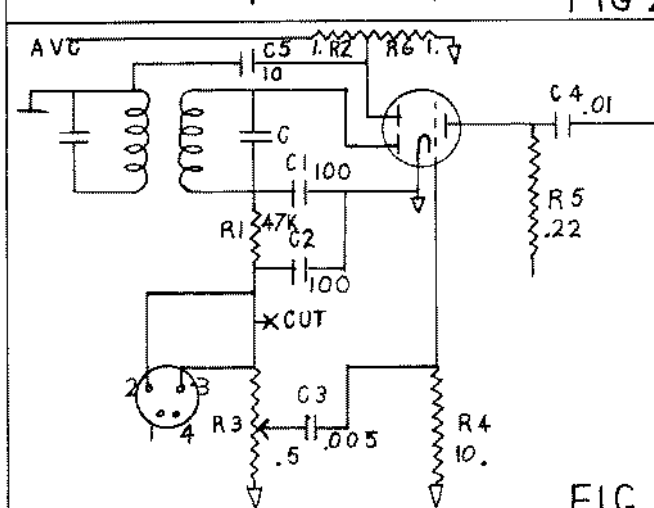


FIG 3

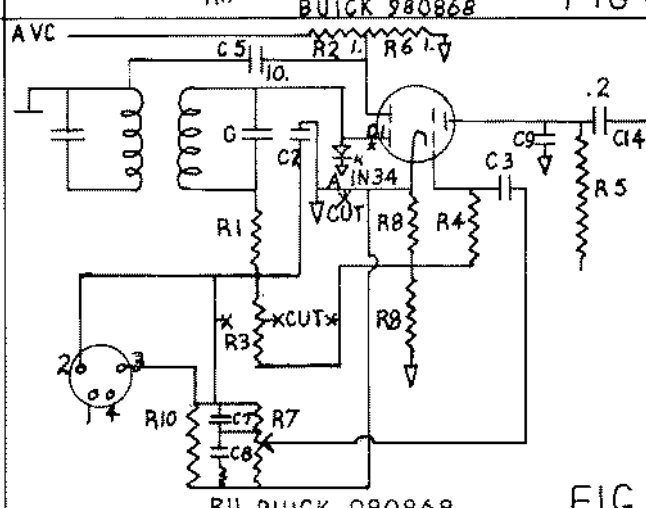


FIG 7

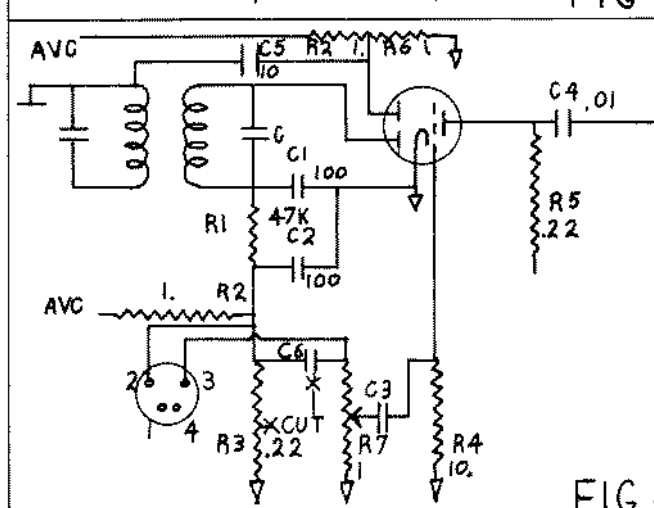


FIG 4

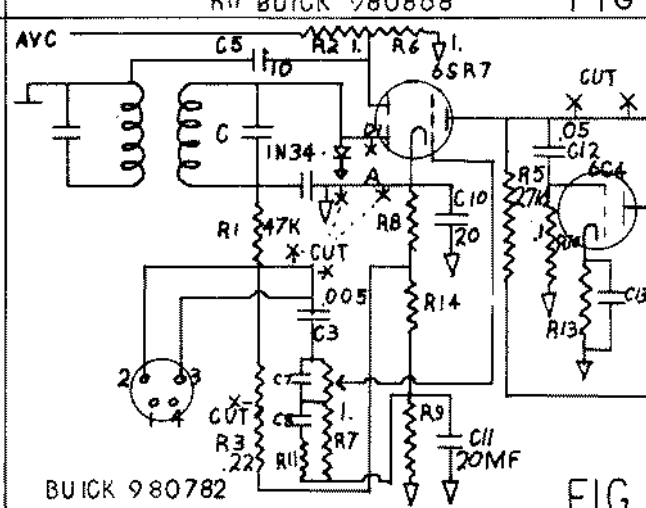
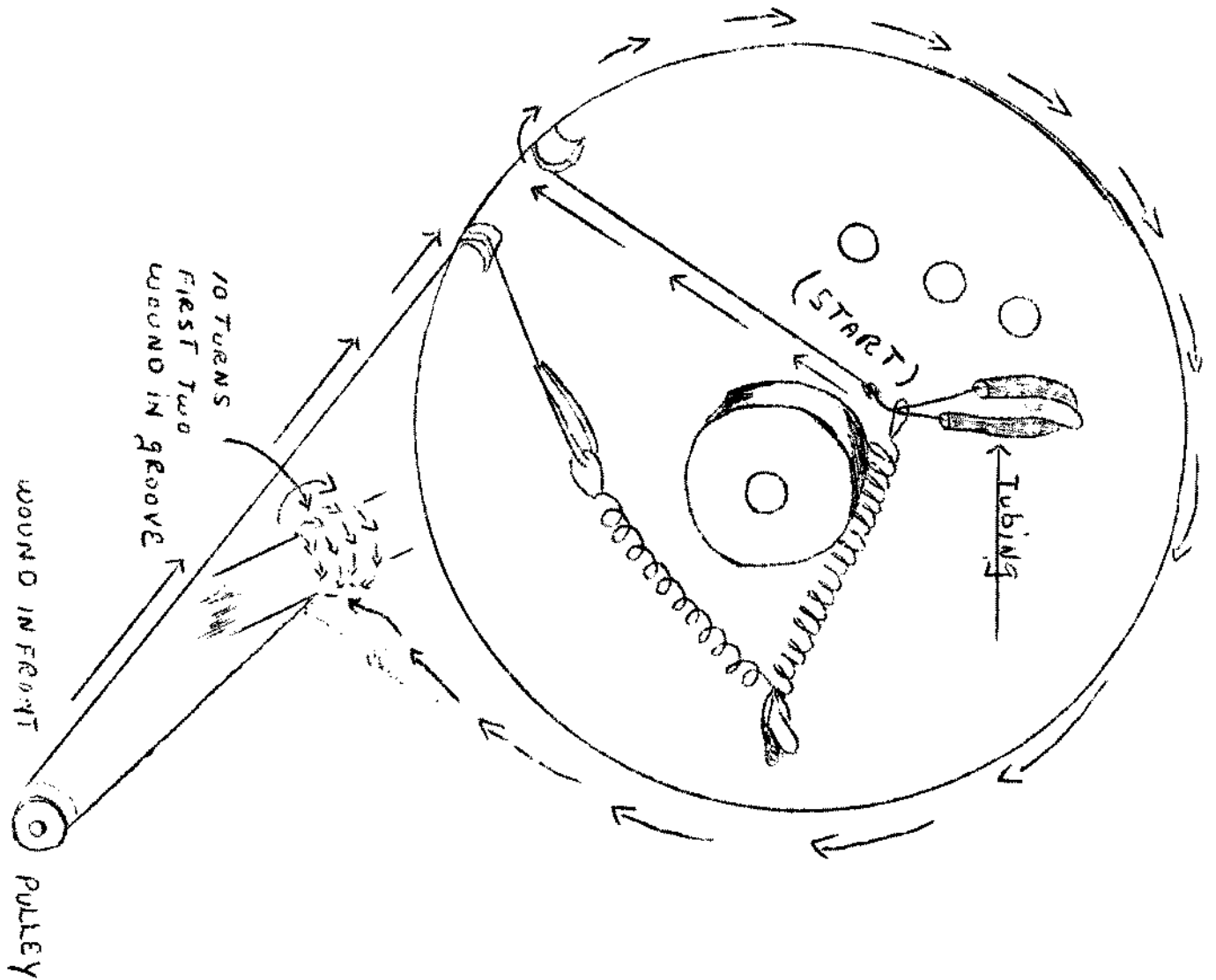


FIG 8

RESISTORS ARE
MARKED IN MEG
OHMS UNLESS
OTHERWISE NOTED.

CAPACITORS ARE
MARKED IN MMFD.
10-100-ETC. OR
MFD .005-.01.

HEAVY WIRE WIND FIRST



LIGHT WIRE

